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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/762,969	01/21/2004	Chok W. Ho	LAM1P152D1/P0692D	6351

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EXAMINER	
VINH, LAN	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 02/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/762,969	HO ET AL.	
	Examiner	Art Unit	
	Lan Vinh	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17,18 and 20-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17,18 and 20-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/12/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 17-18, 20, 22, 23, 25, 29, 30-36 are rejected under 35 U.S.C. 102(e) as being anticipated by Lin et al (US 6,743,732)

Lin discloses a method for forming an integrated circuit formed from an etched low-k dielectric over a substrate. The method comprises the steps of:

placing a hard mask 30 over the organic low-k dielectric layer 24 (col 4, lines 10-13)

forming a patterned photoresist layer 40 over the hard mask 30 (col 4, lines 16-17, fig. 1)

placing the wafer/substrate in an etch tool/etching chamber (col 4, lines 18-19)

flowing an etchant gas comprising NH3 (col 4, lines 29-31), Lin discloses that the NH3 has a flow rate of 50-300 sccm (col 3, lines 5-7), which overlaps the claimed range of 5-1500 sccm

generating a plasma from NH3, which etches the low-k dielectric layer 24 (col 4, lines 29-30), the NH3 etches the low-k dielectric material unexpectedly fast/ selectively etch the organic low-k dielectric layer

etching the low-k dielectric material unexpectedly fast using NH3 and hard mask 30 as a mask (see abstract, fig. 2), which reads on selectively etching the low-k dielectric with respect to the hard mask

during the etching of layer 24/low-k dielectric layer, the photoresist can be removed/stripped (col 4, lines 31-320

The limitations of claims 18, 20, 30 have been discussed above

Regarding claims 22, 25, Lin is silent about the use of bias power, which reads on providing a bias power of about 0 W

Regarding claim 23, in one embodiment Lin discloses forming an etch stop layer 134 over the low-k dielectric 128, forming a second low-k dielectric layer 138 over the etch stop layer 134, the layer 138 is between layer 128 and hard mask 148 (col 4, lines 45-56)

Regarding claims 29, 36, fig. 2 shows that the resist 40 is completely removed after the etching step

Regarding claim 32, Lin discloses providing CHF3 (col 4, lines 37-38)

Regarding claims 33-34, Lin discloses performing an etch with CF4 and C4F8 prior to the step of providing the etchant gas of NH3 (col 4, lines 21-30)

Regarding claim 35, Lin discloses using O2 in the etching step (col 4, lines 22-24)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 21, 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US 6,743,732) in view of Bjorkman et al (US 6,340,435)

Lin method has been described above. Unlike the instant claimed inventions as per claims 21, 37, Lin fails to disclose maintaining the substrate at a temperature between about 10^0 C and 40^0 C during etching of the organic dielectric layer.

Bjorkman discloses a method for forming an integrated circuit comprises the step of maintaining the substrate at a temperature between about 10^0 C during etching of the organic dielectric layer (col 20, lines 1-4)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Lin etching step by maintaining the substrate at a temperature between about 10^0 C during etching as per Bjorkman because Bjorkman discloses that the substrate is cooled at 10^0 C to maintain a thin layer of passivating deposit on the sidewall of freshly etched feature (col 20, lines 3-5)

5. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US 6,743,732) in view of Bjorkman et al (US 6,340,435)

Lin method has been described above. Regarding claim 24, although Lin disclose etching the second low-k dielectric layer (col 5, lines 1-2), unlike the instant claimed inventions as per claim 24, Lin fails to disclose providing a bias power between about 250-2500 W before etching the low-k dielectric layer

Bjorkman discloses a method for forming an integrated circuit comprises the step of providing a bias power about 1000 W before etching the low-k dielectric layer (col 18, lines 57-60)

One skilled in the art at the time the invention was made would have found it obvious to modify Lin step of etching the second low-k dielectric by providing a bias power about 1000 W as per Bjorkman because Bjorkman discloses that the etching is performed at power level of 1000 W for a sufficient time to complete all via through the low-k dielectric layer (col 19, lines 31-34)

6. Claims 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US 6,743,732) in view of Bjorkman et al (US 6,340,435)

Lin method has been described above. Unlike the instant claimed inventions as per claims 26-27, Lin fails to disclose providing etchant gas comprises CF4 and C4F8 for etching the second low-k dielectric layer

Bjorkman discloses a method for forming an integrated circuit comprises the step of

providing etchant gas comprises CF4 and C4F8 for etching the second low-k dielectric layer (col 6, lines 50-51)

One skilled in the art at the time the invention was made would have found it obvious to modify Lin method by etching the second low-k dielectric using an etchant gas comprises CF4 and C4F8 as per Bjorkman because Bjorkman discloses that etching the dielectrics (low-k) is preferably performed with a mixture of gases including one or more gases selected from CF4, C4F8 (col 6, lines 49-51)

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

LV
February 3, 2005